

## HAL System Description

HAL is more than just another DSP drag-and-drop system. It has revolutionized system design and installation.

HAL is an expert in room combining, paging and distributed audio systems. This groundbreaking architecture is dimensions beyond any solution in any industry. HAL easily guides even novice users through what used to be complex tasks in just minutes. No intricate matrix mixing or presets are required for room combining and paging. No virtual wiring is required to distribute pages and background music to multiple, even hundreds of zones.

Seamlessly interface HAL to your application with web controls and/or a broad variety of peripheral devices including smart Digital Remotes, Remote Audio Devices (RADs), portable or rack automixers, audio I/O and logic expansion devices, wall sensors, ambient sensing mics, small remote amplifiers, and an advanced Paging Station.

In addition, the HAL Multiprocessor and Halogen™ software check the status, location, CAT 5 wiring integrity, and that audio is flowing in all peripheral devices, so you know your system is properly connected and ready to go.

Four HAL multiprocessors provide various audio I/O and control options for both large and small installations.

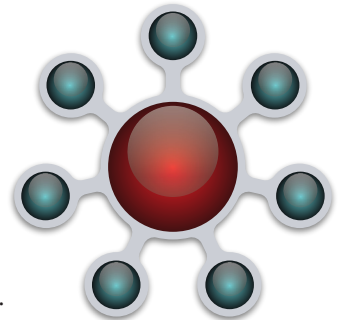
- HAL1x supports 16 in x 16 out audio, which may be increased up to 528 in x 528 out by adding up to 32 daisy-chained Expanders to a single HAL1x. Add a few to hundreds of more mic inputs with AM Automixers.
- HAL2 supports 18 in x 18 out audio, of which 2 x 2 are via AES3 on XLR connections.
- HAL3s supports 6 in x 10 out audio. The 2 “Mic/Line-Plus” Inputs accept balanced, or unbalanced left/right monoed.
- HAL4 supports 2 in x 2 out audio. The 2 “Mic/Line-Plus” Inputs accept balanced, or unbalanced left/right monoed.

See the “HAL Comparison” on page 2.

Since the same Halogen software code runs on both Windows® and within HAL hardware, third-party control developers can test all their code using only the Halogen Windows software. Use only software for complete system design and validation. Buy the hardware only when the install date arrives. Standard TCP/IP set and get ASCII text messages control levels, selectors, presets and toggle software actions.

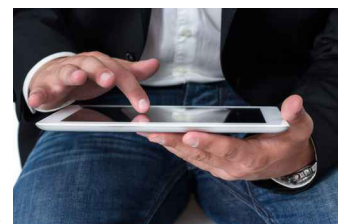
Halogen software includes Ethernet control support for third-party control systems. AMX, Crestron and Stardraw Control Support Packages are installed with Halogen software, or available as separate downloads.

Halogen includes support for custom Web Controls using any device with a web browser such as a tablet, smartphone or laptop.



**HALOGEN**

**Includes Customizable Web Controls**



**Download Halogen and design a system now!**

[rane.com/hal](http://rane.com/hal)

These Support Packages are installed with Halogen software, or available as separate downloads.



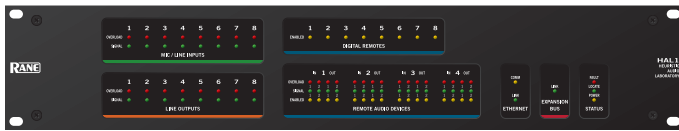
# HAL4 Multiprocessor



## HAL Comparison

### HAL1x Multiprocessor

- 16 in x 16 out - 8x8 analog & 8x8 digital (RAD ports).
- Up to 4 RADs (without EXP1x), up to 260 RADs (with 32 EXP1s).
- Up to 12 Digital Remotes (without EXPs), up to 268 (with EXPs).
- Four logic inputs, Two relay outputs (more with DR4 or DR5).



### EXP1x Remote Audio Expander for HAL1x



### EXP2x Dante Expander for HAL1x (Fall 2014)



### EXP3x Zone Output Expander for HAL1x



### EXP5x Input Expander for HAL1x



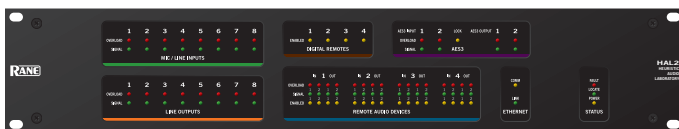
### EXP7x AEC Expander for HAL1x



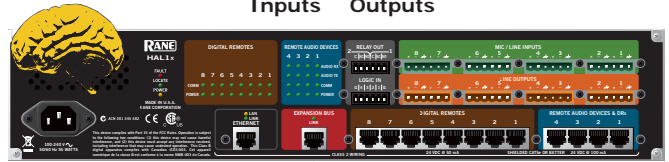
Dante is a trademark of Audinate Pty Ltd, Audinate is a registered trademark of Audinate Pty Ltd. The EXP2x device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased, until authorization is obtained.

## HAL2 Multiprocessor

- 18 in x 18 out - 8x8 analog & 8x8 digital (RAD ports) & AES3 I/O.
- Up to 8 Digital Remotes.
- Four logic inputs (closure), Two relay outputs.
- Four IR Ports for IR2 Wall Sensors.



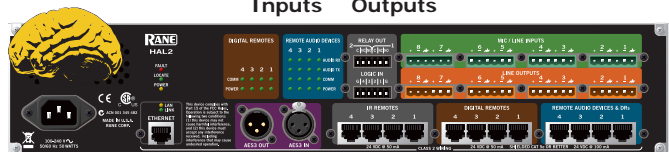
Analog Mic / Line Inputs 8	8 Analog Line Outputs
Digital RAD Port Inputs 8	8 Digital RAD Port Outputs
Digital Expansion into HAL1x 512	512 Digital Expansion from HAL1x
<b>Total in the HAL1x DSP Brain 528</b>	<b>528</b>
<b>Inputs</b>	<b>Outputs</b>



Daisy-chain up to 32 EXPanders

- Adds 16 in x 16 out digital (8 more RAD ports) to HAL1x.
- Up to 8 Digital Remotes or RADs in any combination.
- Chain up to 32 EXP1x units to a HAL1x for 512 in x 512 out.
- Enables HAL1x to send / receive 32 channels to Dante devices.
- Supports 44.1, 48, 88.2 or 96 kHz Dante network sample rates.
- Chain up to 16 EXP2x units to a HAL1x for 512 in x 512 out.
- Adds 8 analog line outputs and 8 logic outputs to a HAL1x.
- Adds 6 Digital Remote ports & 2 RAD ports to a HAL1x.
- Chain up to 32 EXP3x units to a HAL1x for 256 outputs.
- Adds 12 analog mic / line/ line-plus\* inputs to a HAL1x.
- Adds 4 Digital Remote ports to a HAL1x.
- Chain up to 32 EXP5x units to a HAL1x for 384 analog outputs.
- Adds 8 channels of Acoustic Echo Cancelling DSP to a HAL1x.
- Chain up to 32 EXP7x units to a HAL1x for 256 AEC channels.

Analog Mic / Line Inputs 8	8 Analog Line Outputs
Digital RAD Port Inputs 8	8 Digital RAD Port Outputs
(AES3) Input Channels 2	2 (AES3) Output Channels
<b>Total in the HAL2 DSP Brain 18</b>	<b>18</b>
<b>Inputs</b>	<b>Outputs</b>



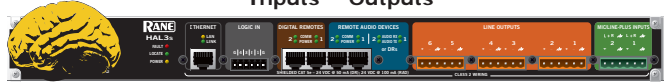
## HAL Comparison

### HAL3s Multiprocessor

- 6 line in x 10 line out - 2x6 analog & 4x4 digital (RAD port).
- 2 Mic/Line/ Line-Plus Inputs.\*
- Up to four Digital Remotes.
- Four logic inputs (closure).



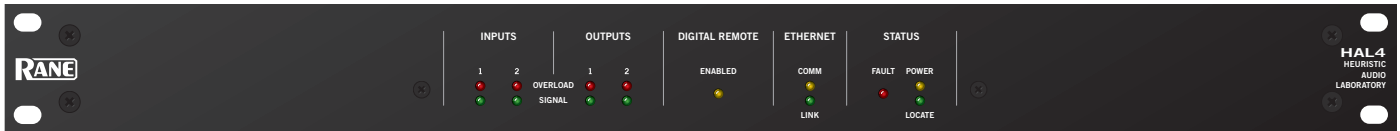
Analog Line-Plus Inputs 2	6 Analog Line Outputs
Digital RAD Port Inputs 4	4 Digital RAD Port Outputs
Total in the HAL3s DSP Brain 6	10
Inputs	Outputs



### HAL4 Multiprocessor

- \* 2 Mic / Line / Line-Plus Inputs are configurable:
  - +4 dBu balanced, mic or line level.
  - +48V phantom available in mic mode.
  - -10 dBV unbalanced Left/Right Monoed.
- 2 balanced line outputs.
- One Digital Remote Port.

Analog Mic/Line-Plus Inputs 2	2 Analog Line Outputs
Total in the HAL4 DSP Brain 2	2
Inputs	Outputs



The HAL4 is a stand-alone 2x2 Halogen replacement for the popular DragNet RPM2 with four-times the processing power, improved digital remote and Web Control options, simplified linking and improved preset recall capability. It solves just about every signal processing problem encountered in one and two room spaces. Some typical applications include:

- House of Worship
  - Education / Gymnasium
  - Theatre / Auditorium
  - Health Clubs
  - Basic PA / Small Meeting Room, and combining two rooms.
- Common device use includes combinations of: Graphic and Parametric EQ • Feedback Suppression • Ambient Noise Compensation • AGC- Compression- Limiting • Delay • Paging • Mixing • 2-Zone remote volume control • HTML web page control from tablet, smart phone or iPad.

The HAL4 is a 2-Input, 2-Output drag-and-drop DSP device for Halogen software. Inputs are Line / Line-Plus / Mic with switchable +48V phantom. In addition to supporting balanced Line and Mic inputs, this configuration allows connecting a stereo pair for conversion to a single L+R mono signal input. This versatile, universal audio input configuration accommodates a wide variety of applications. Standard balanced outputs are provided.

A single DR port provides support for preset recall, level control and selection functions using a DR1, DR2 or DR3. Support is also available for 3rd-party and Web Controls using any device with a web browser such as a tablet, smart phone or iPad. These flexible control options present many possible control solutions.

As with other Halogen host products, the HAL4 connects to a computer via a Gigabit Ethernet Port with Halogen software used for initial system setup. The full suite of processing blocks available with other Halogen host devices is available for the HAL4.

No other 2-channel DSP gives this much bang for the buck!

**Digital Remotes**

Three Digital Remotes simplify end user control and eliminate installer brain fatigue. Use Digital Remotes for volume control, preset recall, source selection, or resetting or toggling system states. All offer customizable backlit LCD screens for intuitive end user labeling. Home run shielded CAT 5e (or better) connections to a HAL or EXP eliminate addressing, external power, and the need to test the cables.

**DR1 Digital Volume Remote**



Level Control

The DR1 supports Level Control.

The DR2 offers Single Selector or List of Toggles/Commands behavior.

The DR3 has three behaviors: Single Level & List of Toggles/Commands, List of Levels for either multizone volume control and/or input source mixing, and Single Level plus Selector.

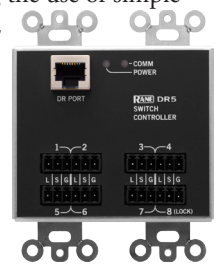
**DR4 Logic I/O Remote**

The DR4 Digital Remote adds additional logic input and output ports to any HAL, enabling simple analog level and logic I/O controls. The rackmount DR4 offers eight logic ins and outs for switches and relays, six IR2 ports for door sensors and eight analog control input ports for pot-on-a-wall level control.

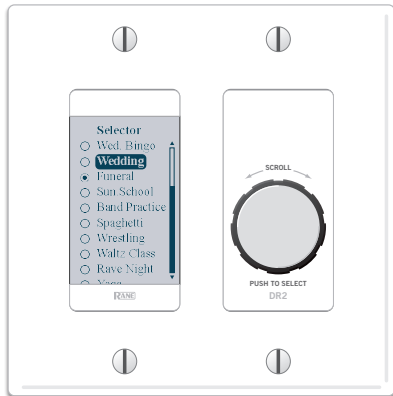


**DR5 Switch Controller**

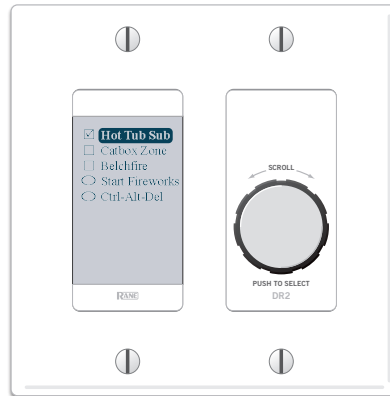
The DR5 Digital Remote offers additional logic input and output ports, enabling the use of simple analog level controls in any HAL system. Lighted switch panels for room combine applications are easily integrated into a HAL system using the eight switch inputs and eight LEDs outputs on a DR5. It fits in a standard US dual-gang electrical box.



**DR2 Digital Selection Remote**

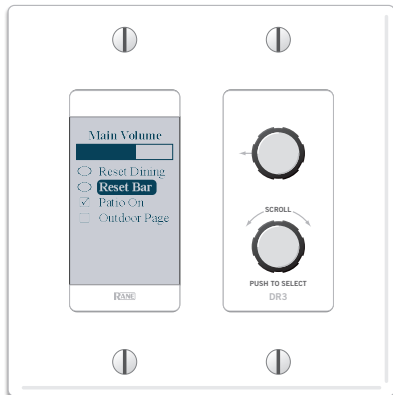


Single Selector

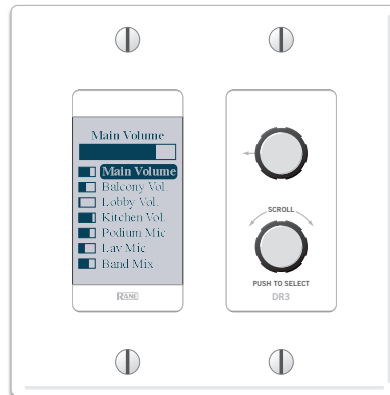


List of Toggles / Commands

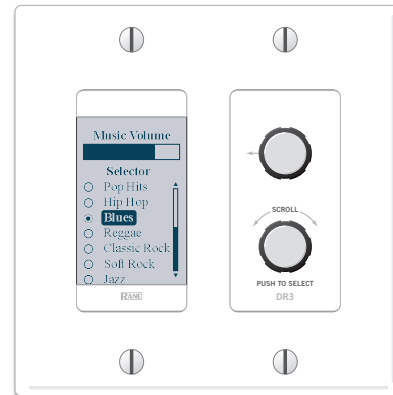
**DR3 Digital Volume and Selection Remote**



Single Level & List of Toggles / Commands



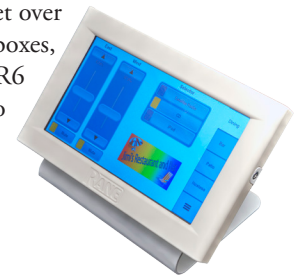
List of Levels



Single Level & Selector

**DR6 Touchscreen Remote**

The new DR6 is a fully customizable touchscreen remote for the HAL family. It supports multiple pages or tabs and any set of levels, toggles, selectors and/or commands. Drag, drop and resize controls any way. Use custom background images and logos in full-color on the 7-inch LCD display. Screw the included wall-mount bracket over U.S. or international electrical boxes, or flush mount the 3/4" thick DR6 with a 2-inch hole in the wall to accommodate the cable. An optional desk stand accessory (shown) allows the DR6 to mount on a horizontal surface.



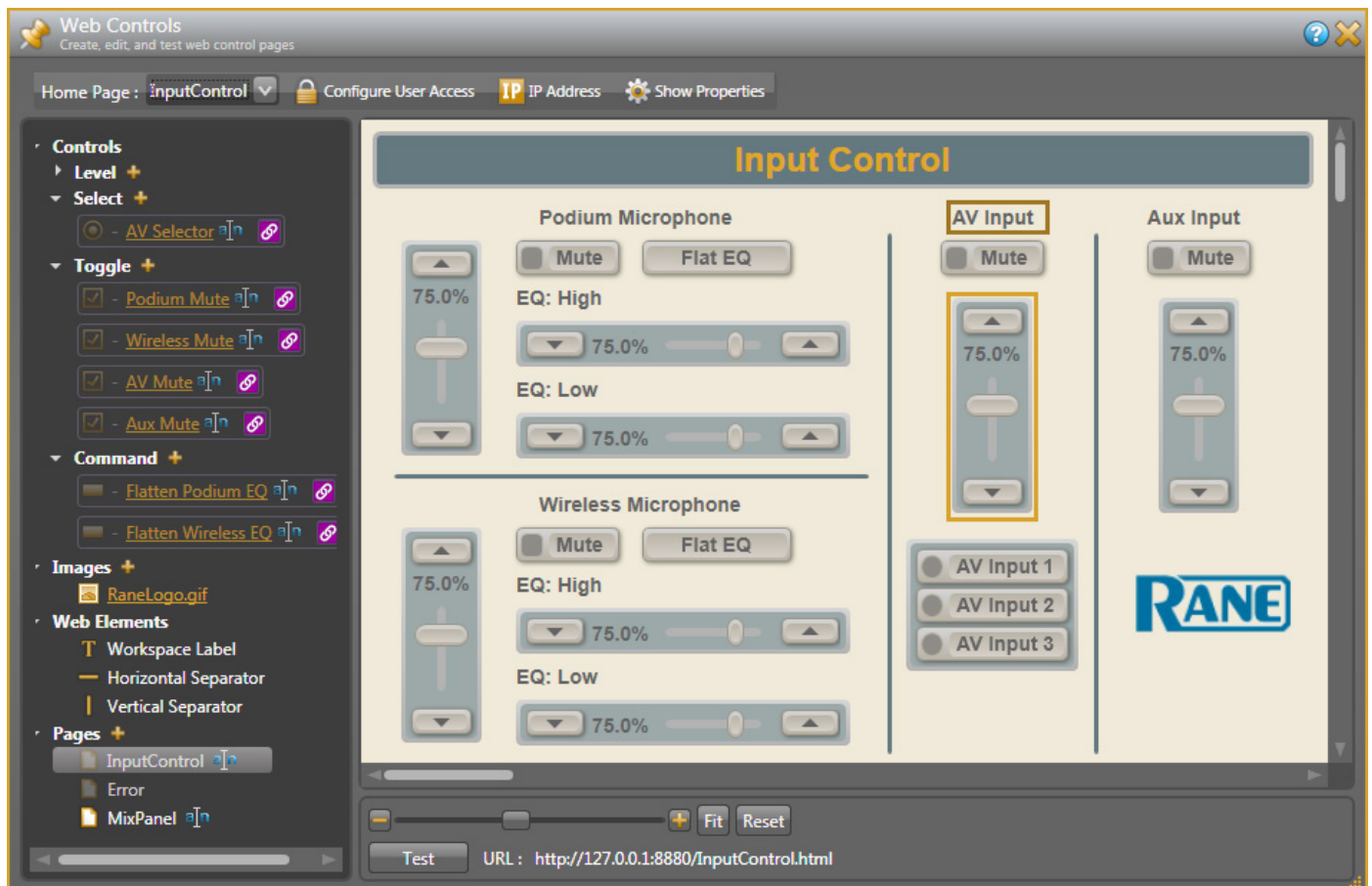
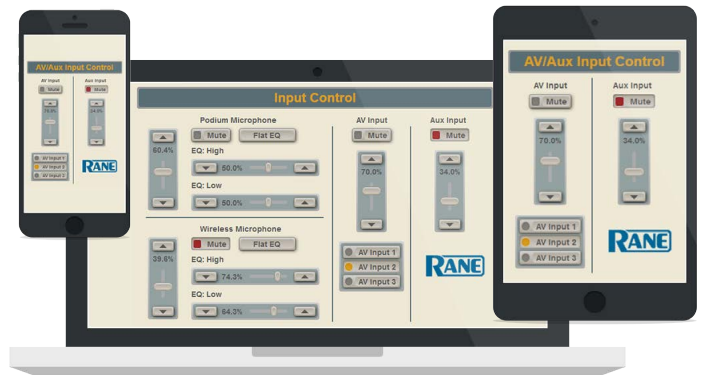
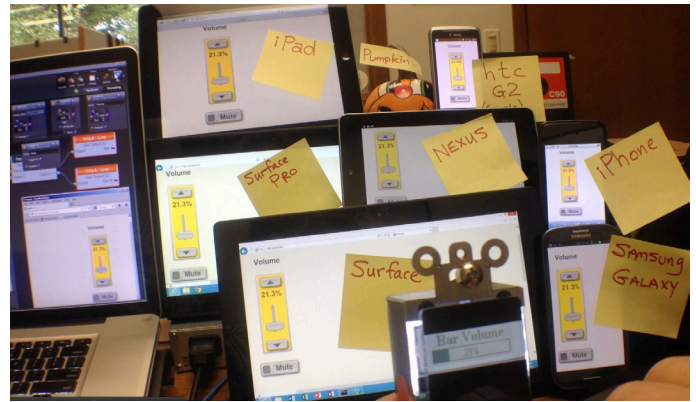
The DR6 ships Fall 2014. *This device has not been authorized as required by the rules of the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased, until authorization is obtained.*

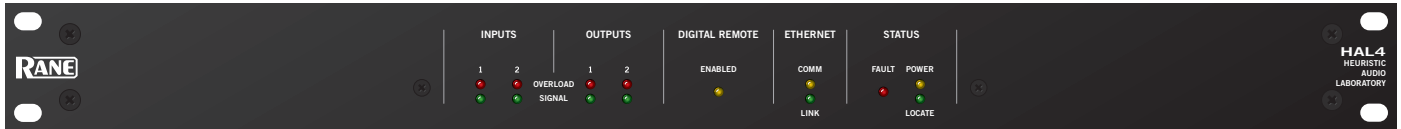
## Halogen Web Controls

Control the Levels, Selectors, Toggles and Commands in any HAL System from any device with a web browser. Halogen 4.0's Web Controls feature allows creation of custom HTML GUI control screens. Define the quantity of control pages, and the layout, labeling and size of each control, and completely test them using your default web browser from within Halogen.

Access any control page from any browser-enabled device on the network with a HAL device. Just open a browser and type in the customizable IP/webpage address for the HTML page – and bookmark it for easy access. Type in the (optional) 6 digit User Access code, and voilà, the trick, she is done! Control your HAL system wirelessly from one or more tablets, smart phones, laptops or desktop computers. The HAL web server is multi-client, allowing control across many devices and many rooms. You can link Rane's wired DR remote controls (DR1, DR2, DR3, DR6) with wireless devices and they'll automatically track each other.

Customers from almost every audio application are asking for "iPad control" and Halogen's Web Controls is the solution. It is not Apple®-centric — no iTunes® store or app installs required. We'll save a lot of space and ink on this page by not listing all the possible devices that support web browsers and wireless Ethernet. Besides, the list will change before the ink dries.



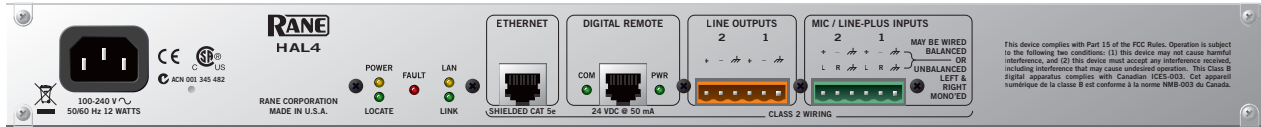


## HAL4 Specifications

Parameter	Specification	Limit	Conditions/Comments
<b>Analog I/O</b>	2 x 2		2 Mic / Line / Line-plus Inputs, 2 Line Outputs
...Connectors	Euroblock		4 x 6-pin, 5 mm pitch, Green = Inputs, Orange = outputs
...CODEC	24-bit, 48 kHz		
<b>All Inputs</b>			Common specifications
...Input Impedance	2.9 k $\Omega$	1%	Each leg to ground
...Inter-channel isolation	>100 dB	typ	20-20k Hz, unity gain, channel-to-channel
...CMRR	55 dB	min	1 kHz
Inputs: Dynamic Mic Mode	Active Balanced		Microphone input mode without phantom power
...Gain	+30 dB to +50 dB	typ	+30 dB (analog gain), 1 dB steps to +50 dB (digital gain)
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Equivalent Input Noise	-120 dBu	typ	20-20k Hz, 150 $\Omega$ source, 30 dB gain
...Maximum Input	-18 dBV (125 mVrms)	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k $\Omega$ load, Mic Input to Output
Inputs: Condenser Mic Mode	Active Balanced		Microphone input mode with 48V phantom power
...Gain	+18 dB to +38 dB	typ	+18 dB (analog gain), 1 dB steps to +38 dB (digital gain)
...Phantom Power	+48 VDC		10 mA max per input
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Equivalent Input Noise	-110 dBu	typ	20-20k Hz, 150 $\Omega$ source, 18 dB gain
...Maximum Input	-6 dBV (500 mVrms)	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k $\Omega$ load, Mic Input to Output
Inputs: Line+ Mode	Active Summer		Left ("+") and Right ("-") signals summed to mono
...Gain	0 dB to +20 dB	typ	0 dB (analog gain), 1 dB steps to +20 dB (digital gain)
...THD+N	< 0.007 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Maximum Input	+14 dBu	typ	1 kHz, < 0.01% THD+N, each leg
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k $\Omega$ load, Line-plus Input to Output
...Dynamic Range (in to out)	108 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 50 $\Omega$
Inputs: Line Mode	Active Balanced		Balanced line level input
...Gain	0 dB	typ	0 dB (analog gain), 1 dB steps to +20 dB (digital gain)
...THD+N	< 0.005 %	typ	20-20k Hz, +4 dBu out, 0 dB digital gain
...Maximum Input	+14 dBu	typ	1 kHz, < 0.01% THD+N
...Frequency Response	20-20k Hz, +0.0 / -0.3 dB		+4 dBu out, 100k $\Omega$ load, Line Input to Output
...Dynamic Range (in to out)	108 dB	max	re +20 dBu, 20 kHz BW, A weighted, Rs = 50 $\Omega$
<b>Outputs</b>	Active Balanced		
...Impedance	200 $\Omega$	1%	Each leg
...Maximum Output	+20.0 / +15.5 dBu	typ	1 kHz, 100 k $\Omega$ / 600 $\Omega$ load

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Parameter	Specification	Limit	Conditions/Comments
<b>Front Panel Indicators</b>			
...Signal	-50 dBFS	typ	Green LED, peak-reading, 250 ms hold time
...Overload	-0.5 dBFS	typ	Red LED, peak-reading, 250 ms hold time
<b>Propagation Delay</b>	2.2 ms	typ	Analog in to analog out
<b>DSP</b>			
...HAL4 Processing Power	2100 MIPS	max	1 DSP @ 266 MHz with up to 8 instructions / cycle
...Word Length	32 / 64-bit Floating Point		
...HAL4 Delay Memory	20 seconds	max	
<b>Computer Interface: Type</b>	Ethernet 1000 base-T		Zeroconf service discovery protocol for easy set up
...Cable	Shielded CAT 5e or better		RJ-45 connector
...Length	100 meters / 300 feet	max	Standard Ethernet cable length limit
<b>DR Port</b>	1		RJ-45 connector
...Power	24 VDC @ 50 mA	max	
...Cable Length	300 meters / 1000 feet	max	Shielded CAT 5e cable or better
<b>Wiring</b>	Class 2		All rear panel terminals
<b>Power Requirement</b>	100 to 240 VAC		50/60 Hz, 12W max
<b>Ambient Room Temp.</b>	45 °C	max	Maximum external loading
<b>Unit: Conformity</b>	CE, FCC, cCSAus		
<b>Unit: Size</b>	1U, 1.73"H x 19"W x 8.25"D		(4.4 cm x 48.3 cm x 20.9 cm)
...Weight	4.8 lb		(2.2 kg)
<b>Shipping: Size</b>	6.5" x 20.3" x 13.75"		(16.5 cm x 52 cm x 35 cm)
...Weight	8.8 lb		(4.5 kg)

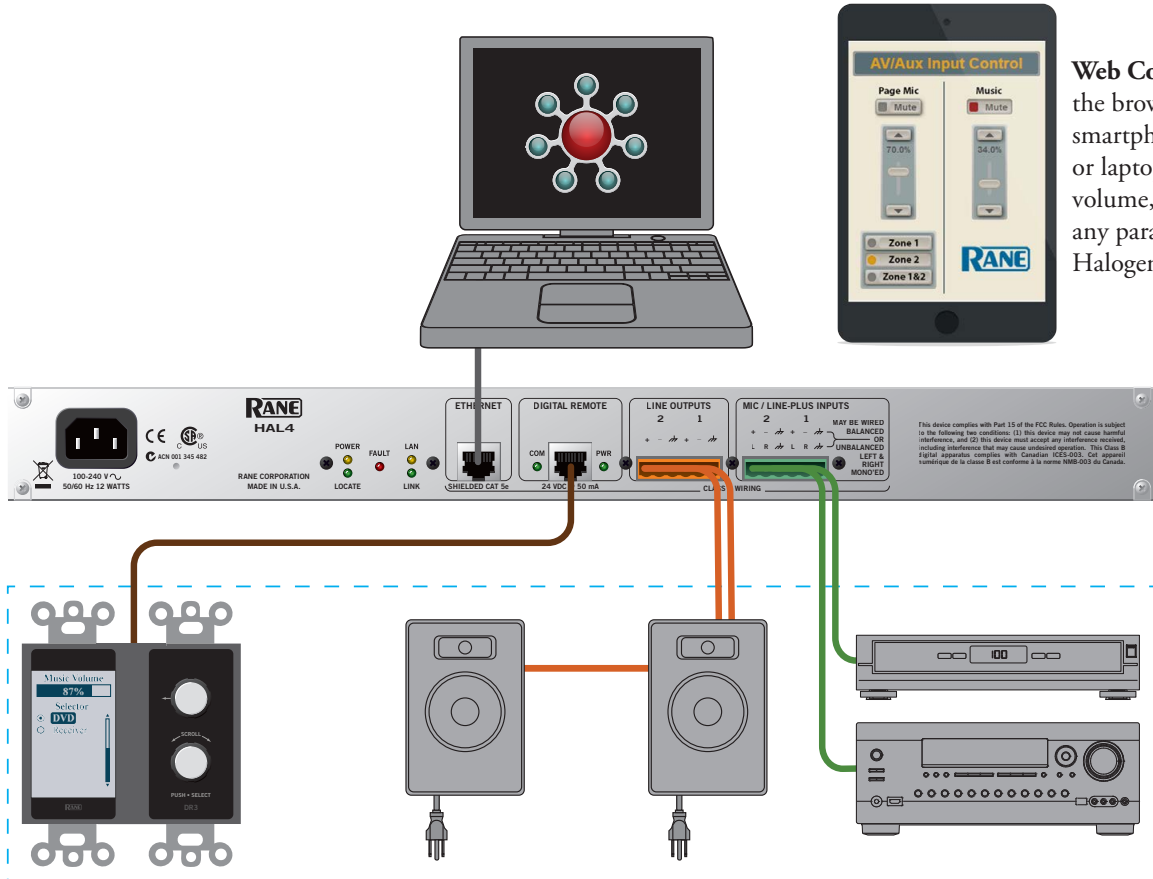
## HAL4 Multiprocessor Architects & Engineers Specification

The digital multiprocessor shall be a 2 in x 2 out configuration. The two analog inputs shall have microphone or line-level selection and include a +48V phantom power selection. These two inputs shall exist on a plug-in barrier strip that can be either +4 dBu balanced or -10 dBV unbalanced with left (+) and right (-) automatically monoed. The two analog outputs shall be balanced line-level on plug-in barrier strips. Provisions shall be provided for one digital remote to control source or preset selection, toggle and/or level control located up to 300 meters (1,000 feet) away. The digital remote shall connect via shielded CAT 5e (or better) cable to the multiprocessor. Further, the digital remote device shall support portable use and hot swapping so that devices may be replaced without shutting down the system, and do so without any audio interference, and that all settings for new devices are automatically downloaded

from the multiprocessor along with the correct firmware. The unit shall connect to a computer using standard Ethernet on an RJ-45 connector. All functions shall be designed, configured and controlled by a software program featuring a graphical user interface that allows managing the global tasks of discovering, connecting to, and applying configurations to the remote digital multiprocessor. The hardware-software combination shall automatically check and display the status, location, CAT 5 crimp and wiring integrity. The hardware multiprocessor and the software shall each include Ethernet ASCII text over TCP/IP control support for third-party control systems such as AMX, Crestron and Stardraw Control, and capable of creating controls for use in a web browser. The processor shall have an internal 100-240 VAC, 50/60 Hz power supply.

*The digital multiprocessor shall be a Rane HAL4 running Rane Halogen software, and using a Digital Remote (DR).*

**Example HAL4 Background Music System**



Web Controls use the browser in any smartphone, tablet or laptop to control volume, source or any parameter in Halogen.

**Applications**

Simply put, the HAL4 has a ton of DSP horsepower. Combine this with the flexibility of drag and drop system design and the HAL4 fits a variety of applications, simple or complex. Such as:

- A 2-channel Graphic Equalizer using Rane's Perfect-Q technology. Store and recall different EQ curves using presets.
- Add several bands of parametric filters for precise EQ.
- Add a limiter on each output for speaker protection.
- Add compression or AGC for dynamics control.
- Give one of the inputs Priority for automatic source selection.

It's easy to make a small restaurant or office system with two zones with presets for source selection.

Replace one of the line sources with a paging mic and now you have a simple two-zone music/paging system. Halogen makes it easy to set up emergency paging, adjust the ducking, eliminate feedback, and configure a backlit DR remote so anyone can easily control volume, the source, or both.

